

ADULT FISHWAY INSPECTIONS  
ON THE COLUMBIA AND SNAKE RIVERS  
1984

Larry R. Basham

Water Budget Center  
2705 E. Burnside, Suite 213  
Portland, OR 97214

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## ADULT FISHWAY INSPECTIONS ON THE COLUMBIA AND SNAKE RIVERS - 1984

### BACKGROUND

Fishways generally are operated at full criteria from March 1 through November 30, although some dams operate at a lesser flow during the winter from December 1 through February. Mainstem projects which have adult fish passage facilities are inspected by project operators, fishway attendants, and state and federal fishery agencies. Surveillance teams composed of federal and state fishery agencies inspected fish passage facilities on a regular or irregular schedule to ensure that fish are passing upriver with little delay at each project, and that upstream fish passage standards established by fishery agencies and tribes are being followed.

During 1984, the responsible agencies to inspect fish passage facilities were as follows:

1. Washington Department of Fisheries - Wells Dam
2. Oregon Department of Fish & Wildlife - The Dalles, John Day, Little Goose and Lower Granite Dams
3. Washington Department of Game - Rock Island and Rocky Reach Dams; Priest Rapids and Wanapum Dams from March 1 through August; and Lower Monumental and Ice Harbor Dams from September 1 through October.
4. National Marine Fisheries Service - Bonneville Dam; Ice Harbor and Lower Monumental Dams from May 1 through August; and Priest Rapids and Wanapum Dams from September 1 through October.
5. Different fishery agencies - McNary Dam.

The surveillance team members also made on-site inspections of fingerling bypass systems to ensure that they were operating "in criteria". Juvenile passage facilities vary from nonexistent at some projects to complex systems with latest equipment and designs. In some cases, such as where transportation of juvenile salmonids occur, there is 24 hours-per-day surveillance by project and state personnel. At these dams, the team members contact state and project fish biologists to ensure that the facilities have been operating according to criteria.

Members of the surveillance team fill out a form which gives pertinent data for each project. When the inspector has completed inspection of the project, he/she is expected to follow-up on areas that were "out of criteria". Those items are relayed to the operations section. Plant operators or fishway attendants usually accompany the inspector and are able to make on-site changes to ladder weirs or other areas that are not "in criteria". In most cases, changes made to fish ladder operation are completed by the next day. The inspector sends a copy of the inspection to the WBC Field Operations Coordinator who ensures that the projects follow through on problem areas noted in the report.

Fish ladders are to be inspected on a regular basis, about once a month or preferably once every two weeks during periods when large numbers of adults are passing a project. Generally, a call is made by the WBC Field Operations Coordinator to the inspectors either after a fishway inspection when there are questions about the inspection, or when inspection forms are not received as anticipated indicating an inspection was not made or not sent to the WBC.

#### GENERAL RESULTS

The overall movement of upstream migrants in 1984 appeared to be satisfactory with few delays except for summer steelhead from Bonneville to upriver projects. Generally these delays occur annually when water temperatures increase in mid or late July and are not related to passage facilities at lower river projects. Special efforts were made by fishery agencies and Corps personnel to check on potential problems which appeared to exist at The Dalles and John Day Dams this year. However, adult passage facilities were operating "in criteria" and fish may have been delayed by temperature or other factors.

Inspections were generally made once a month. Some shuffling of monitoring schedules was necessary this spring due to availability of appropriate personnel to make inspections at McNary, Ice Harbor, and Lower Monumental Dams. On a temporary basis, McNary was inspected by WBC and other state and federal agencies while NMFS monitored Ice Harbor and Lower Monumental Dams from late May through the end of August. Beginning in September, the Washington Department of Game began monitoring Ice Harbor and Lower Monumental while NMFS began monitoring at Priest Rapids and Wanapum Dams on a permanent basis. McNary will require

inspections by an agency on a regular basis by next season. The USPWS has agreed to monitor McNary beginning next April.

Some changes were made at various projects to enhance passage of adults and juveniles throughout the season. Examples include establishing basic operating standards, increasing adult fish attraction flows at some projects, refining spill patterns for adults and juveniles, and upgrading equipment to provide better fish passage conditions within the bypass systems.

Some projects were operating at less than full criteria as seen during inspections by fishery agencies this year. It appears that during periods of low tailwater, certain projects have difficulty maintaining proper head at main fishway entrances. Some main entrance gates bottom-out and water depth over these weirs are not up to desired criteria. Also it was noted that auxiliary water pumps were not being run at a rate to achieve the desired amount of water for attracting fish to the fish ladders and maintaining proper head at main fishway entrances.

The Corps of Engineers and PUD's are aware of these system shortcomings. The projects are working to upgrade fish passage facilities, and keep them operating "in criteria". These power agencies should continue to improve passage conditions at their projects.

#### SUMMARY BY PROJECTS

##### LOWER COLUMBIA RIVER

###### Bonneville Dam

The NMPS inspected the fish passage facilities at Bonneville Dam. The following table indicates dates and inspection results this season.

<u>Date</u>	<u>Comments</u>
4/3/84	Adult facilities were operating "in criteria". Juvenile facilities will require some corrective action on STS and 2nd powerhouse Downstream Migrant (DSM) facility modification. A meeting was scheduled between NMPS and CoE on DSM modifications.
5/3/84	Adult facilities were operating "in criteria". Adult fish trap

- operating at 2nd ph fish ladder. Spillway gate #2 was being worked on. Juvenile system 1st ph - flow running south to ice/trash sluiceway. 2nd ph - several orifice jets not smooth, possibly plugged.
- 5/22/84 Adult facilities appeared to be operating "in criteria". An incomplete inspection of 2nd ph. was made, due to lack of time by inspector. Project personnel are not keeping up with maintenance on STS.
- 6/24/84 Trash rack @ left bank FV intake had nearly a foot drop (Required cleaning). Debris also present on louvers. At the 1st powerhouse, the juvenile bypass system flow was changed to north on 6/21; brushes were cleaning the inclined screen once every 30 minutes. Debris load was light.
- 8/10/84 Adult system was "in criteria" but two staff gauges needed cleaning. Juvenile facility at 1st ph not operating on automatic control as designed and fluctuating water surface causes problems at the inclined screen weir crest and makes fish sampling almost impossible.
- 9/7/84 The adult fish passage facilities were again "in criteria". The juvenile passage system (1st ph) had loose mounting bolts on orifices 1b, 4b,c, 6b, 7c, 8a,b, and c, 9a and b. Jim Limbaugh indicated that his crews were epoxying the bolts to the walls at orifices.
- 10/10/84 The adult facility appeared to be operating according to standards. At the 2nd ph, weir submergence was 11 feet or greater at the 4 entrances with head of 1.0 - 1.3 feet. Unit #5 turbine was out of service. The juvenile bypass downwells were dewatered at both powerhouses. The water was running south at the 1st ph and through the emergency relief conduit at the 2nd ph.

Throughout the season, adult fish passage facilities operated admirably. Passage facilities were "in criteria" whenever inspected. Generally, adults migrating past the project experienced excellent passage conditions at Bonneville. Based on fish counts, adults apparently prefer the Washington shore ladder over the Oregon shore despite the fact that generation and water flow at the Oregon shore was much greater than the Washington shore. Based on recent data from radio tagged fish, passage time decreased significantly at the second ph collection system.

Response by the Corps at Bonneville Dam was excellent regarding operation of the adult passage facilities in 1984.

### Adult Ladder Modifications and Special Operations

Major structural modifications were made on the Bonneville Dam Cascade Islands fish ladder beginning about November 1 and required the Cascade Island branch ladder be out of service this past winter. The modifications will correct structural deficiencies that have developed due to construction of the second powerhouse. The modifications were completed prior to the 1985 adult spring migration. Also, fish water turbines at the second powerhouse were tested for generator efficiency. The testing was scheduled from November 15 to about January 1. The adult fish ladder was operated at less than full criteria, but still allowed operation of two main entrances with  $1\frac{1}{2}$  feet of head between the collection channel and tailrace and 8 feet of water depth over the entrance gate. One fish water turbine can pump approximately 3400 cfs and provide the necessary water to meet the criteria above, The Corps requested the time deviation because of all the necessary workload on the adult and juvenile facilities during the winter maintenance period.

### The Dalles Dam

Oregon Department of Fish and Wildlife inspected adult and juvenile fish passage facilities at The Dalles Dam. The following table lists dates and inspection results for this season.

<u>Date</u>	<u>Comments</u>
4/20/84	Adult facility was "in criteria." Head measured 1.2 feet over ladder weirs, and 8 feet over entrance weir gates. Juvenile sluiceway system was operating satisfactorily.
5/10/84	Adult facility was operating "in criteria". Head over ladder weirs and entrance gates, was o.k. Collection channel transportation flows were within the range of 1-4 fps. The juvenile passage system was operating in day-time criteria.
5/23/84	The adult/juvenile passage systems had several problems on this particular inspection. Part of problem occurred because a Geodetic Survey Project caused the forebay to be below daylight downstream migrant criteria of elevation 158-160. The low forebay also reduced north ladder make-up water so head between the entrance pools and tailwater was only 0.6 foot. A low head reading at the east entrance was improved to 1.1 feet at 11:00 AM by increasing gate openings on

fishwater turbine units F1 and F2. The transport and collection channels were slower than desired.

7/18/84 The project fish passage facilities were "in criteria". Sluiceway was operating for daytime passage of juvenile salmonids. All "head" readings were excellent and collection and transportation channel flows were good.

8/23/84 The adult fish passage facilities were operating "in criteria". The major change was in operation of the ice/trash sluiceway system. Sluice gates open were: 1.1, 17.3, and 18.1. Criteria indicated gates 1.1, 1.2, and 1.3 should have been operated. The change in sluiceway operation was made based on research results by ODFW. However, these results were not incorporated into the fishway operating criteria so the sluiceway gate settings were changed after the mistake was noted.

Fish passage facilities were generally "in criteria" whenever inspected. Adult fish appear to pass the project with little delay. On one occasion during the fall (week of September 16) it appeared that there might have been a major blockage of fish at The Dalles, but no physical damage was found in the fish ladder, and it was operating "in criteria". The entire ladder was observed by Corps personnel to assure that passage facilities were in good shape. CoE's response to facility operations at The Dalles has been excellent throughout the year.

#### New Operations for 1985

During the winter maintenance period, The Dalles Dam will upgrade the counting facilities at the east ladder fishway. The counting station will incorporate a vertical slot counting station with underwater viewing rather than the horizontal flash board system of counting. An off ladder trap will be in service during the spring to capture adults as a part of the radio tracking/tunnel studies at McNary Dam.

#### John Day Dam

Oregon Department of Fish and Wildlife inspects adult and juvenile fish passage facilities at John Day Dam. The inspections and observation dates are listed:

#### Date

#### Comments

4/20/84 Adult fish passage facilities were "in criteria". The John Day River

plume was very muddy. Turbidity reading in south ladder was 0.7 feet. The staff gauges were repaired, cleaned, and readable. The spillway gates were being painted during this time frame with Unit 3 sealed, 8 and 9 being painted, and 7 and 10 sealed to reduce water spray for painter safety. On juvenile facilities, the contractor has been driving piling which will support the juvenile bypass flume. There was concern that this job was slowing down adult fish migration. About 40-50 seagulls were flying at downstream migrant release site, however, no successful dives were seen in 10 minute observation.

5/10/84 The southshore ladder was well under criteria for head differentials and this was primarily because Oregon fish pump #1 was red-tagged and out of service. The pump was scheduled to be back on line on 5/11/84. This is one of the gear box turbine pumps which has been a continuing problem. With Turbine Unit #1 operating at 156 MW, it appeared that the south shore entrance was wiped out. The north shore entrance had only 6.4 feet submergence. No spill was occurring during the day, so the adult collection system stabilized and good adult passage occurred from about 12:00 on. There were many activities at the project including: gatewell dipping, sonar monitoring, trash rack cleaning, painting spill gates, changing stop logs, drilling for juvenile migrant bypass, and digging and blasting at the downstream migrant channel.

5/23/84 The north shore and south powerhouse entrances head differentials were 0.8 and 0.9 feet, respectively, compared to the 1.0 foot of head required. All entrance gates were "in criteria" (8 feet). Number one turbine unit was operating at 158 MW; well above the desired 80-100 MW. Two Washington pumps are out of service leaving no backup pumps when four pumps are needed at higher tailwater elevations. Spillway gates are still stop-logged for painting (4,6,7).

7/18/84 Floating orifice #9 was on deck for repair, not enough water was being sent to north powerhouse gates (1&2) and the 0.8 foot of head was below the criteria of 1.0 foot. Although the situation was temporary, one of the gates could have been raised to achieve proper head. Spillgate number 20 has provided good attraction flows to the north powerhouse gates this season. This spill was provided to move juveniles from the bypass system quickly into the main river flow. The project has done an excellent job of cleaning shad off the picketed

leads at the counting stations. All 6 Oregon fish pumps are back in service or available for standby service.

8/23/84 Staff gauges for north and south powerhouse entrances were broken or dirty, making head readings impossible. Salvage system will be operating until the end of August. Spill was being provided through Spillbay #20 and attraction flows to adults was probably being aided.

As noted in the comments, the project had some difficulties keeping proper head at major entrances throughout the year. Some of the problems were caused by rapidly fluctuating tailrace conditions which affects head on entrance gates, etc. It appears the project could run an additional auxiliary pump and add extra water to ensure that entrance conditions, i.e. head and weir depth could be met.

Spillway patterns observed this spring were at times poor for adult passage, due to spillway gates being repainted by a separate contractor. Spillways on each side of the painted gate were shut down for safety reasons and to reduce water spray on the fresh paint. The agencies recommended that painting spillway gates should be delayed until after the spill season was over.

On two of the inspection days, turbine unit #1 was operating at 156 MW or over, which is well above the 80-100 MW maximum specified in the operating criteria. Operation of unit #1 in an overload condition constitutes a serious problem for adult salmonids seeking the south powerhouse (shore) entrance. Studies indicate better passage at the lower discharge rate.

John Day had many on-going construction projects this season. A concern early in April was the possible delay of adult salmon due to construction of the juvenile bypass system flume. Piling was driven next to the adult fish ladder and created vibration and noise. However, spring chinook passage at John Day compared favorably with The Dalles final count.

#### McNary Dam

McNary Dam was inspected on eight different occasions. Dates and results of inspections are listed:

#### Date

#### Comments

2/23/84 On the initial inspection, items which were not "in criteria" follow:

- Several floating orifices were sunk, staff gauges were unreadable, and the north shore weir entrance was too shallow.
- 5/29/84 The north shore entrance was out of criteria. Gate depth on north powerhouse entrance was less than 8 feet. Spillbay number 14 will be out of service all year. No staff gauges are readable at McNary, which requires the fishway inspector to rely on other mechanical gauges to obtain head readings.
- 6/13/84 The north shore entrance gates were submerged to 6.8 feet depth with 0.9 foot of head. The north powerhouse entrance had only a 0.7 foot head differential to the tailrace. Low readings at this location were caused by some floating orifice gates either sunk or floating high along the collection channel. The juvenile facility was operating "in criteria".
- 6/26/84 The gauges on the north shore were all recalibrated and were operating within criteria on this inspection. Several floating orifices were almost sunk and again the head differential between the north powerhouse fishway and tailrace was only 0.8 foot. Both fishway ladders were passing fish at a fairly steady rate. The project has been conducting a fish counting evaluation this season. There are apparent discrepancies between visual observation and counting by video observation. Results of the test should help determine if additional counters are needed at the project.
- 7/11/84 The project was cleaning windows at the counting stations and operating on ladder orifice flow until cleaning is completed. A Trouble Report was put on floating orifice #2. The operator said the project was planning on adding more water along the collection channel and to the north powerhouse entrances. The pump blades will be changed from 26" to 28". The NPE had less than 8 feet of depth at the weir gates and 0.8 foot head differential between the entrance and tailrace. Juvenile fish are barged from the facilities on an every other day schedule. What this operation has shown is that the floating orifices were in sad shape. When a barge came in to load juveniles, spill was shut down and the tailrace dropped dramatically. Many of the wheel bearings were worn out and the floating orifices would stick and subsequently overflow when the tailrace rose (corresponding with the fish barge leaving) and, as a direct result, starve the north powerhouse entrance.

- To fix this, the Corps has been repairing floating orifices, approximately two per week and will continue until all are overhauled.
- 7/25/84 The floating orifices continue to stick (sink), but the maintenance staff is removing the sunk orifices from their slots and replacing them with modified orifices. On this occasion, the north powerhouse entrance gates were less than 8.0 foot depth. The project was doing electrical work on the gates and by 7/27 the 8.0 feet depth was achieved.
- 8/13/84 The adult passage facilities were much improved, all weir gates were set at 8.0 feet or greater, the collection channel had at least 1.0 foot head differential to tailrace, and head differential at entrances were 1.1 feet at the north shore and south powerhouse entrances and 0.9 foot at the north powerhouse entrance. The pumps (3) were all set at 28". At the juvenile facilities, today was the last day for barging fish; trucking will continue until about September 28.
- 9/25/84 The adult fish passage facility appeared to be in good shape although the major entrance and south powerhouse entrance gates were at 7.7 and 7.0 feet rather than 8.0 foot of head. The floating orifices were in good shape and fish ladder exits were OK. The project had dropped the pump angles from 28 to **24°**. The juvenile facility will shut down by the 29th and fish will be bypassed to the sluiceway until October 31.

The adult fish passage facility operated at less than criteria during many of the inspections this season. Overhauling the floating orifices should improve flow along the collection channel as well as provide more water to the north powerhouse entrances. Project personnel were concerned that the system was losing water somewhere along the channel and had referred the problem to the engineering group in Walla Walla. The response by the project to facility problems was much improved by the season's end.

#### Adult Facilities Modifications Proposed for 1985

An evaluation of the adult fish passage facilities will be conducted by the Portland District Corps of Engineers research biologists. Tunnel studies and radio tracking will require detection equipment be placed at entrances to monitor fish passage into or out of the adult collection system and passage times at the dam.

Preliminary data indicate that some serious problems existed between video counts and actual observed counts. The Walla Walla District Corps of Engineers will fund additional fish counters in 1985. This should make fish counts at McNary Dam much more reliable than in past years.

#### MID-COLUMBIA RIVER

##### Priest Rapids Dam

New operating standards and criteria were adopted by Grant County PUD this year. An approximate 3000 cfs total auxiliary water flow will be provided to attract and pass anadromous fish. Much time and effort was spent to establish these criteria, and adult passage should be improved because of this change.

During this season, Washington Department of Game monitored the adult passage facilities through August. National Marine Fisheries Service began inspecting the facilities on a permanent basis on September 1. Inspection results follow:

<u>Date</u>	<u>Comments</u>
4/9/84	On this initial inspection, turbine unit #1 was going down, and the entrance reading at the LEW2 entrance showed only 0.5 foot of head differential. This situation was temporary. Left fishway staff gauge needed cleaning. Fish counters were on 8 hours per day; two shifts will begin on April 21.
6/29/84	Hydraulic drop or head differential should be a minimum of 1.0 foot at all entrances. LEW2 and LEW4 head was measured at 0.6 and 0.5 foot, respectively.
7/26/84	Head at LEW2 and LEW4 was less than 1.0 foot. One fish pump was down. One of the main concerns was the velocity, or lack of velocity, in the powerhouse collection channel. Some diffusers were opened or closed in an attempt to increase water velocity (partially successful). The project will continue working with the system to increase channel velocity.
9/13/84	The project apparently could not reach the level of flow that had been agreed upon by Grant County PUD, as entrance flows were low, and collection channel velocity was still lower than desired. Operation Manuals for Priest Rapids were reviewed by NMFS staff and Wes Monroe,

project engineer, who both concluded that LEW gates and powerhouse collection water channel (upper end) were supplied with auxiliary water from butterfly gates at diffusers LV25 - LV33. They had been operated on automatic control since the 60's. The project was planning to modify the automated system so that desired flows could be met.

10/17/84 The auxiliary flows were greatly increased at this inspection, and weir submergence at LEW2 and LEW4 were 14.6 and 10.4 feet respectively. The right ladder had 8.0 feet submergence. The system looked much improved.

#### Facility Modifications for 1985

After the last inspection on October 17, 1984, it appeared that the adult fish passage facility was operating satisfactorily; however, collection channel along the powerhouse still has flow velocities less than desired. The project should attempt to measure channel flows and improve apparent low velocities. There will be no changes proposed for the adult passage system.

#### Wanapum Dam

Wanapum adult passage facilities were inspected by Washington Department of Game through August, with National Marine Fisheries Service beginning inspections in September on a permanent basis.

New operating standards were adopted at Wanapum this past season. Facilities were operated at the higher regimes established for the project. Five inspections were completed this year.

#### Date

#### Comments

4/9/84	The facility was operating acceptably with no major deviations from criteria. Fish counting is not done, so there is no indication of adult passage at the project.
6/29/84	This inspection was not completed because no operator was available to go around with the inspector. Approximately 50% of the water was being spilled, which makes it essential that proper spill patterns be evaluated to determine effects on fish passage.
7/26/84	The project was operating in criteria. The spillway was on seal.
9/13/84	Head measured at each of the entrances was at least 1.0 feet with weir

submergence at the right bank entrance of 8.2 feet. The right and left gravity regulating valves were open 50" and 30° respectively. Depth over ladder weirs were 1.6 feet, generally a little higher than necessary.

10/17/84 Head differential measured at each entrance varied from 1.0 - 1.8 feet, with 8.2 feet weir submergence at the right bank entrance. Depth over ladder weirs was 1.6 and 1.5 feet. The left and right gravity regulating valves were open 33" and 50" respectively.

#### Proposed Operation in 1985

The adult passage facilities will be operating under the criteria established for 1984, with no major modifications proposed for the system.

#### Rock Island Dam

The project was inspected by the Washington Department of Game. Inspection dates and comments follow:

<u>Date</u>	<u>Comments</u>
4/10/84	The project was inspected with some deficiencies noted, especially at the new powerhouse entrances. Head measured at the entrances was not being achieved (1.5 feet with a 3 feet minimum opening.) Depth over ladder weirs were satisfactory. These and other items relating to Rock Island and Rocky Reach were discussed with the Chelan PUD biologist.
5/8/84	Fish are counted 16 hours per day at the project. The same conditions as above were noted. Head at the middle fishway, left powerhouse entrance, and the downstream right powerhouse entrance were 0.8, 0.5, and 0.8 feet respectively, far below the 1.5 feet head required for the system. The TRE rotary creeps closed within a several hour span, and was less than the 3 feet minimum required opening, as was the LPE-1.
7/27/84	Again, LPE-1 and TRE measured less than 36 inches gate width (32 inches), and head was 0.3 and 0.7 feet, respectively. Attraction flows for both entrances were poor, mainly due to lack of adequate flows through the entrance gates. Despite good looking surface flows from the left and middle fishways, weir submergence was only 5.6 and 3.2 feet, respectively. The auxilliary water pump gate openings were at 44.6%, 70.8%, and 43.0%. Gravity attraction gate, R04POS, was at 50%.

It appears that the project pumps should have been opened more to raise the level of bifurcation pool to about 1 foot 6 inches.

10/3/84 Head measured at LPE-1 and TRE was 0.27 and 0.62 feet respectively.  
This reduced flow provided fair to poor attraction at these entrances.

Throughout the season, the project was unable to meet criteria at several of the main entrances. Staff gauges should be provided so that tailwater readings can be taken at the LPE, RPE, and TRE sites. Control room readings for tailwater elevations in the specific area are not totally accurate. The middle fishway entrance weir cannot be submerged below elevation 566. That entrance should be modified to account for low tailwater elevations. Another problem has been the left fishway transport channel. These areas of concern have been previously addressed by CBFWC letters.

#### Proposed Modifications for 1985

Chelan County indicated that modification of the middle fishway entrance gate and guides was proceeding, and it was felt this problem would be solved very soon. Also auxiliary water problems are being addressed. Electric pumps and motors have experienced gear problems (shafts at **90°**), but are now operating more effectively, although still not up to design capacity. Additional efforts have also been made at the gravity auxiliary water downwell. The considerable energy dissipation in the downwell has caused problems for steel and concrete alike. A gravity gate opening of 50% is expected for this year.

Long term auxiliary water solutions are being contemplated by Chelan. Thought has been given to turbine generating and turbine-pump solutions.

The left bank transport channel low velocity problem has been studied. Chelan envisions this problem to entail a costly solution.

Chelan County has addressed the problem of 2nd powerhouse gates being out of criteria by increasing the bifurcation pool to tailwater head to 1.8 ft. Numerous readings were taken to determine if this will spread flow more evenly to the 4 entrances.

It is essential that Chelan County PUD attempt to upgrade or modify its system to meet adult criteria in the near future.

#### Rocky Reach Dam

Washington Department of Game inspected the adult fishways at the project this year. There have been some improvements made in adult passage facilities in recent years, but there are still problems apparent from review of the inspector's report:

<u>Date</u>	<u>Comments</u>
4/10/84	On this initial inspection, the need for staff gauges in key locations was apparent.. Locations should be below all the main entrances as well as one in the exit fishway so that a direct reading of the ladder's weir crest head can be measured. Also, clarification of criteria with reference to current rotary gate entrances was recalculated. It appeared that more water was needed at a couple of the entrances because the rotary gates were less than 36 inches open.
5/8/84	Head at the left powerhouse entrances was 0.64 feet, while the spillway entrance measured about 0.56 feet. Tailwater elevations varied from 0.2 to 0.8 feet at the powerhouses. Staff gauges adjacent to the ladder entrances are necessary.
7/27/84	Determining spillway entrance pool elevation was not possible because of lack of staff gauges. The project is pumping about 2,200 cfs plus 67 cfs gravity flow. The picketed barrier head differential at the exit ladder was $5\frac{1}{2}$ inches with weeds and trash evident. The rotary gate at the right downstream powerhouse entrance was set at $34\frac{1}{2}$ inches. Head measured at the left and right powerhouse entrances was 1.28 and 1.25 feet, respectively.
8/10/84	Head at main entrance varied from 1.13 to 1.4 feet. The left powerhouse attraction appeared lost in turbulence from turbine unit 811. Head on the picketed barriers measured 8.75 inches and the barriers were being raked immediately after the inspection was completed.
10/3/84	Head at the left and right powerhouse entrances measured 1.75 and 1.5 feet, respectively. No readings were possible at the spillway entrance but there appeared to be good attraction. Rotary wing gates were set at 30 and 34 inches at the right powerhouse entrance.

### Proposed Facility Modifications for 1985

The adult facility should have staff gauges installed so that direct head readings will be possible at main entrances and the exit ladder.

Adult spill criteria will be automated and computerized with unit 11 on a first off at less than powerhouse capacity. This should greatly improve attraction in tailwater at the left powerhouse.

### Wells Dam

The Washington Department of Fisheries inspected Wells adult fishways during 1984. Results of the inspections follow:

<u>Date</u>	<u>Comments</u>
3/8/84	The initial inspection found the facility operating in criteria. Attraction flows looked good and ladder flows were one foot over weirs.
4/11/84	The adult fishway was operating in criteria in reference to head at fishway entrances and the fish ladder. Again, attraction flows looked excellent. The project operators indicated that spill configurations set up for 1984 could not be met due to the mechanical makeup of their spill gates. Not all of the spill gates are automated which precludes making rapid changes on spillgate operation.
5/4/84	The project was operating in criteria. Normal FERC spill is from 8 p.m. to 6 a.m. One spill bay was open (8 feet) to pass excess river flow. Fish counting began 5/1/84 on a 16 hour/day basis.
6/4/84	The forebay was being drawn down for another study during the summer. There was only 1.2 feet head differential on the east bank fishway because of the low forebay. The #1 turbine unit was down on this particular day. River flow was 193,500 cfs with 23,500 cfs spill.
7/26/84	All entrances to the fish ladder were in criteria and attraction flows looked good. Spot checks made by the inspector throughout the month were satisfying with no problems noted with the adult fish passage facilities. The adult sockeye run was excellent this season. Summer chinook trapping on the west bank ladder began July 10 and will continue through October 1 on a 16 hour/day, 5 day/week regime.
9/25/84	The adult passage facilities were in criteria. All ladder gages match up with the control room.

### Modifications for 1985

No major modifications of the fish passage facilities are scheduled for 1985.

### SNARE RIVER

#### Background

Burt Carnegie, Oregon Dept. of Fish and Wildlife, has studied fish passage efficiency at Snake River projects and developed present spill schedules from model studies with full powerhouse loading. The studies have not been verified in prototype, and no evaluation of a partially loaded powerhouse has been made in either model or prototype.

It was noted from the model that fish passage efficiency at the Snake River dams began to decrease at spills from 60,000 to 100,000 cfs with full powerhouse discharges. For example, adequate spill patterns could not be achieved above 60,000 cfs at Lower Granite Dam.

A multi-agency team should be assembled to assess various spill configurations for adult passage at Snake projects. Adult passage studies by the Corps indicate severe passage problems at spills over 40,000 cfs, but inadequate time has been spent developing adult spill criteria to verify this. Spill patterns should be looked at in coming seasons to verify patterns established, and verify what levels of spill cause reduced fish passage.

#### Ice Harbor Dam

The National Marine Fisheries Service monitored Ice Harbor Dam from May through August. Washington Department of Game began inspecting passage facilities on a permanent basis from September on. The following observations were made during the fishway inspections.

#### Date

#### Comments

3/28/84	The project was in criteria in reference to head on weirs (1.0-1.3 feet). The south shore powerhouse entrance was slightly less than the required 8 feet. Floating orifices along the face of the powerhouse were all operating properly. One pump was being repaired, but the remaining 7 pumps were able to maintain adequate flows in the fishways.
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The project was not counting fish; projected counting date is April 1. Also the project began operating the ice/trash sluiceway at maximum capacity, about 2700 cfs flow, including orifice discharge. The automated chain gates are being tested this week to see if there are any unseen "bugs" which might creep in. The six chain gates are at 3½ feet depth, and designed to operate within a 3 inch range. The chain gates operated flawlessly, a great improvement from last season.

- 5/23/84 The project was operating in criteria, except the north shore entrance weir submergence was 7.1 rather than 8.0 feet; however, head measured from entrance to tailwater was 1.6 feet. The entrance condition looked fairly good despite 73,000 cfs spill.
- 6/21/84 Total river discharge was 201,000 cfs with a spill level of 97,100 cfs. The project was operating in criteria. One of the fish pumps was out of service due to bearing problems.
- 8/14/84 All pumps were available for service on this inspection. Weir submergence at the NPE and north shore entrance was 4.0 and 5.9 feet, respectively, well below the required 8.0 feet depth. It appeared additional pumps could have provided adequate water to meet the criteria. Flow was down to about 30,000 cfs.
- 9/17/84 Some of the staff gages needed cleaning, and the north shore tailwater gage replaced. Idaho was trapping fall chinook adults in the south ladder to use as broodstock for Lyons Ferry Hatchery. An electrician was working on SFE-2; it was not operating properly. Collection channel flows are about 4 fps.
- 10/22/84 The weir depth at the north shore was only 5.4 feet. Staff gages still needed cleaning. Depth over the south shore ladder weirs was 0.8 foot, compared to the required 1.0 foot head.

In general, the project appears to have a good adult passage facility with spare pumps on the south shore system and large entrance gates. Flipslips were not placed on the spillbays, and the spill pattern looks good under most conditions. On several inspections, proper head over the weirs was not achieved. It appeared pumps were available to provide increased flow to the entrances and the project should be able to keep the adult passage system operating in criteria.

### Project Modifications for 1985

At present, no major rehabilitation plans are planned for the adult facilities. As routine maintenance, the north shore pumps (spillway ladder) will be painted and seals replaced. August is the best time to have the tailwater low enough to accomplish the task without causing safety problems. Fish numbers passing the project on the north shore ladder are very low in August. The attraction water (pumps) will be shut down from August 12-30. The north shore fish ladder will remain watered up and operating. The south shore ladder will not be affected, and will remain in service.

### Lower Monumental Dam

National Marine Fisheries Service monitored the facility from May through August, with Washington Department of Game beginning inspections in September on a permanent basis. Observations follow:

<u>Date</u>	<u>Comments</u>
4/10/84	The project had problems with fish pumps this past winter, and a cleanout plate was being installed on each pump to facilitate debris removal. Debris had been jammed in the turbine section of the pumps, reducing flows into the fishways. Two of the 3 fish pumps were operating so the fishway flows were less than desired; example - head on weirs of 0.9 feet rather than 1.0-1.3 feet, and submerged entrance weirs less than 8 feet. The project will have the 3rd pump operating by the end of this week. Fish counting will begin on April 1. Unit 1 turbine is out of service this season allowing additional spill at the project, but this should not impede adult passage.
5/23/84	At the time of the inspection, fish turbine pump #1 was down, causing all entrances to be way out of criteria. The pump was fixed and restarted on 5/24 at 2:30 p.m. The diagnosis was a cracked fitting on vacuum side of oil pump which caused over heating and automatic shut off of the pump. Spillgate #1 was being painted and will be operational the following week.
<b>6/22/84</b>	River flow was <b>222,000</b> cfs with a spill of <b>127,400</b> cfs. The <b>3</b> fish pumps were operating at 71 rpm prior to the inspection. The fishways were in criteria except head, 0.7 foot, measured at the north powerhouse entrance.
8/14/84	Head at each entrance was at least 1.0 foot. Weir depth measured at

the south powerhouse (4.0 feet) and south shore (2.7 feet) entrances was less than criteria. Fish pumps were running at 66 rpm and more water was needed to meet criteria at the south powerhouse and shore entrances.

- 9/17/84 Weir depth at the south entrances was under criteria. Pump speed was 66, 65, and 64 rpm for the 3 pumps. New floating orifice operation will be 1, 2, 3, 7 and 9, due to Turbine Unit #1 out of service. This configuration will give more attraction flows in unit #1 area.
- 10/23/84 Staff gages needed cleaning; some were entirely unreadable. Head at the south shore entrance was 0.6 foot, while the south powerhouse weir depth was less than 6 feet. The discrepancy between staff gage readings and powerhouse gages has been corrected.

The project did not meet to head and weir depth criteria at main entrances on most of the inspection trips. Although there are obvious problems meeting established criteria, the Corps should work at improving fishway flows. On occasions, the fish pumps were run between 64-66 rpm while head was not up to criteria. It appears the pump speed could be increased to provide more auxiliary water, hence provide more attraction flows/head at the main entrances. The agencies are requesting a meeting to address operational and design shortcomings at Lower Monumental and Little Goose Dams.

#### Little Goose Dam

The Oregon Department of Fish and Wildlife inspected Little Goose on 7 different occasions this year. Observations follow:

<u>Date</u>	<u>Comments</u>
3/28/84	A minimum depth of 1.0 foot head at the north powerhouse and north shore was not being achieved. Pump speed was 70 rpm for each of the three operating pumps. The south shore entrances were operating in criteria.
4/19/84	River flow was up to 136,400 cfs with a spill level of 52,800 cfs. The north powerhouse entrance had only 0.5 foot of head. Pump speed was 68, 70, and 69 rpm.
5/7/84	Head at both the north entrances was less than 1.0 foot. The south shore entrances were operating with a 1.3 foot head and weir submergence of 8.0 feet.

- 5/24/84 The river flow was **up** to 207,000 cfs with spill of 73,200 cfs. The south shore entrance gates were at 7.0 and 7.8 feet - out of criteria. The ladder weirs have been maintained at 1.0 head during inspections to date.
- 6/22/84 River flow was again very high, 216,900 cfs, and a spill level of 82,200 cfs. Since there is no fish counting at Little Goose, it is difficult to know impacts of higher spill and flow levels on fish movement. In past years, higher spill levels dramatically increased the passage time for adult fish. It becomes even more important that fish passage systems are at least meeting minimum criteria during high spills, and that spill patterns are correctly followed.
- 7/22/84 Head at both north entrances was under established criteria. The project should boost flows to meet criteria set by fishery agencies and tribes. Pump speeds were 68, 70, and 70 rpm. The project began working on a solution to provide more water to the north entrances. They will maintain about 1.7 feet of head on the south shore entrance in an attempt to provide 1.0 foot of head at the north shore entrance by increasing pump speed to about 71 or 72 rpm.
- 9/5/84 The facility was able to maintain 1.0 foot head at the north shore entrance with a 1.8 foot head at the south shore entrance.

Little Goose Dam has problems maintaining head at the main entrances because of the hydraulic conditions which exist. To reach 1.0 foot head on the north shore, head at the south shore must be kept about 1.7 feet. There are no diffusers beyond the north powerhouse entrance, so water must be "pushed" across the collection channel to the north shore entrance. This design does not allow the gates to be set at what agencies consider a minimum setting, i.e. 8 feet below tailwater. The project spent considerable time trying to adjust flows and provide the best possible conditions with the system. It appears there are still improvements necessary to provide better adult passage conditions at Little Goose. As at Lower Monumental, turbine pumps are typically run at less than design speed to reduce wear and tear. These pumps are designed to operate at 80 RPM, but have not operated above 74 RPM for a number of years.

### Lower Granite Dam

The project was inspected on 6 different occasions this year by Oregon Department of Fish and Wildlife. Results of the inspections follow:

<u>Date</u>	<u>Comments</u>
3/28/84	The facility was operating at less than criteria at the north shore entrance. Head was measured at 0.7 foot. All other entrances and head were in criteria. Two of 3 water supply pumps are operated at Lower Granite. Fish were being counted one shift, 8 hours per day.
4/17/84	River flow was 125,300 cfs with a spill level of 39,200 cfs. All entrances were in criteria. Turbine Unit #4 was out of service. Fish are counted 16 hours/day.
5/22/84	River flow was 189,100 cfs with a spill level of 63,100 cfs. Past experience shows the north entrances to be wiped out above 60,000 cfs due to fliplips placed in all 8 spill bays. The turbulence created by the fliplips tends to seriously distort the entrances. Head at entrances was in criteria; however, weir depth at the north powerhouse was less than 8.0 feet.
6/25/84	The facility was operating in criteria in reference to head, collection channel velocity, and fish ladder flows. Spill level was 48,300 cfs.
7/24/84	The north shore head reading was 0.7 foot. Staff gage in the collection channel was unreadable on this inspection.
9/6/84	North and south shore collection channel staff gages were unreadable at present elevations. South shore tailwater staff gage was also unreadable. Weir depth at both north powerhouse and south shore entrances was under criteria, 7.5 and 7.6 feet rather than a minimum of 8.0 feet.

Lower Granite operated two fish pumps throughout the adult passage season. They met criteria under most conditions.

#### ADULT FISHWAY INSPECTIONS - 1985

Fishery agency personnel assigned to inspect adult fishways should make their first inspection prior to the adult fish migration (early April) and continue monitoring through October. Reports should be sent to the Water Budget Center. Problems seen at the project should be discussed with the fishway attendants or operators for resolution if possible. The Water Budget Center will coordinate unanswered problems with the agencies and tribes.

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